# 4. SUMMARY OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

## 4.1 GENERAL

On 1 October 1980, JTWC's area of responsibility (AOR) was expanded to include the Southern Hemisphere from 180° east longitude, westward to the coast of Africa. Details on Southern Hemisphere tropical cyclones and JTWC warnings from July 1980 through June 1982 are contained in Diercks et al. (1982) and from July 1982 through June 1984, in Wirfel and Sandgathe (1986). Information on Southern Hemisphere tropical cyclones after June 1984 can be found in the applicable Annual Tropical Cyclone Report.

The NAVPACMETOCCEN, Pearl Harbor, Hawaii issues warnings on tropical cyclones in the South Pacific, east of 180° east longitude. In accordance with CINCPACINST 3140.1V, Southern Hemisphere tropical cyclones are numbered sequentially from 1 July through 30 June. This convention is established to encompass the Southern Hemisphere tropical cyclone season, which primarily occurs from January through April. There are two Southern Hemisphere ocean basins for warning purposes - the South Indian (west of 135° east longitude) and the South Pacific (east of 135° east longitude) - which are identified by appending the suffixes "S" and "P," respectively, to the tropical cyclone number.

Intensity estimates for Southern Hemisphere tropical cyclones are derived from the interpretation of satellite imagery using the Dvorak (1984) technique and, in rare instances, from surface observations. The Dvorak technique relates specific cloud signatures to maximum sustained one-minute average surface wind speeds. The conversion from maximum sustained winds to minimum sea-level pressure is obtained from Atkinson and Holliday (1977) (Table 4-1).

## 4.2 SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

The total number of significant tropical cyclones during the 1993 season (1 July 1992 - 30 June 1993) (Table 4-2) was 27 which matched the overall climatological mean for the past 13 years as shown in Table 4-3. However, looking at the annual variation of Southern Hemisphere Tropical Cyclones by ocean basins (Table 4-4), it becomes apparent that this mean value of 27 occurred with lower than normal activity in the South Pacific and South Indian

**Table 4-1** MAXIMUM SUSTAINED 1-MINUTE MEAN SURFACE WINDS AND EQUIVALENT MINIMUM SEA-LEVEL PRESSURE (ATKINSON AND HOLLIDAY, 1977) RELATIONSHIP

| WIND-KT | (M/SEC) | PRESSURE (MB) |
|---|---|---|
| 30 | (15) | 1000 |
| 35 | (18) | 997 |
| 40 | (21) | 994 |
| 45 | (23) | 991 |
| 50 | (26) | 987 |
| 55 | (28) | 984 |
| 60 | (31) | 980 |
| 65 | (33) | 976 |
| 70 | (36) | 972 |
| 75 | (39) | 967 |
| 80 | (41) | 963 |
| 85 | (44) | 958 |
| 90 | (46) | 954 |
| 95 | (49) | 948 |
| 100 | (51) | 943 |
| 105 | (54) | 938 |
| 110 | (57) | 933 |
| 115 | (59) | 927 |
| 120 | (62) | 922 |
| 125 | (64) | 916 |
| 130 | (67) | 910 |
| 135 | (69) | 906 |
| 140 | (72) | 898 |
| 145 | (75) | 892 |
| 150 | (77) | 885 |
| 155 | (80) | 879 |
| 160 | (82) | 872 |
| 165 | (85) | 865 |
| 170 | (87) | 858 |
| 175 | (90) | 851 |
| 180 | (93) | 844 |

Ocean basins and higher than normal activity in the Australian basin. The above-average activity in the Australian basin tied the 13-year record high of 16 established in 1986. By comparison, the occurrence of only one tropical cyclone in the South Pacific tied the 13-year record low set in 1991 for that basin.

The JTWC was in warning status a total of 102 days, which included 25 days when the JTWC issued warnings on two or more Southern Hemisphere tropical cyclones, and seven days with three. There were no days with four or more occurring simultaneously. A chronology is provided in Figure 4-1. All tropical cyclone warnings with the exception of those for Tropical Cyclones 04S, 13S (Lena), 18P (Nisha) and 26S (Konita) were preceded by Tropical Cyclone Formation Alerts. With regard to tropical cyclones with estimated maximum surface winds of 130 kt (67 m/sec) or greater, 1993 was the first year since 1987 without any in the Southern Hemisphere. Composites of the best tracks appear in Figures 4-2 and 4-3.

**Table 4-2** SOUTH PACIFIC AND SOUTH INDIAN OCEAN SIGNIFICANT TROPICAL CYCLONES, 1993 SEASON (1 JULY 1992-30 JUNE 1993)

| TROPICAL CYCLONE | PERIOD OF WARNING | WARNINGS ISSUED | MAX SURFACE WINDS-KT (M/SEC) | ESTIMATED MSLP (MB) |
|---|---|---|---|---|
| 01S Aviona | 27 Sep - 01 Oct | 8 | 65(33) | 976 |
| 02S Babie | 18 Oct - 21 Oct | 6 | 45(23) | 991 |
| 03P Joni | 06 Dec - 12 Dec | 17 | 110(57) | 933 |
| 04S ---- | 07 Dec - 10 Dec | 12 | 35(18) | 997 |
| 05S Ken | 19 Dec - 23 Dec | 9 | 45(23) | 991 |
| 06P Nina | 23 Dec - 04 Jan | 28 | 75(39) | 967 |
| 07P Kina | 26 Dec - 04 Jan | 23 | 120(62) | 922 |
| 08P ----* | 02 Jan - 03 Jan | 3* | 45(23) | 991 |
| 09P ----* | 11 Jan - 13 Jan | 5* | 30(15) | 1000 |
| 10S Colina | 14 Jan - 21 Jan | 14. | 95(49) | 948 |
| 11S Dessilia | 20 Jan - 21 Jan | 2 | 35(18) | 997 |
| 12S Edwina | 20 Jan - 29 Jan | 19 | 110(57) | 933 |
| 13S Lena | 24 Jan - 29 Jan | 11 | 55(28) | 984 |
| 14P ----* | 26-28 Jan/06-07 Feb | 8* | 35(18) | 997 |
| 15P Lin* | 31 Jan - 04 Feb | 9* | 90(46) | 954 |
| 16P Oliver | 04 Feb - 12 Feb | 17 | 115(59) | 927 |
| 17P Mick* | 05 Feb - 09 Feb | 8* | 45(23) | 991 |
| 18P Nisha* | 12 Feb - 16 Feb | 10* | 65(33) | 976 |
| 19S Finella | 13 Feb - 15 Feb | 6 | 75(39) | 967 |
| 20P Oli | 16 Feb - 18 Feb | 4 | 50(26) | 987 |
| 21P Polly | 25 Feb - 03 Mar | 14 | 100(51) | 943 |
| 22P Roger | 12 Mar - 18 Mar | 13 | 55(28) | 984 |
| 23P Prema | 27 Mar - 01 Apr | 14 | 125(64) | 916 |
| 24S Jourdanne | 03 Apr - 09 Apr | 14 | 125(64) | 916 |
| 25S Monty | 10 Apr - 12 Apr | 4 | 50(26) | 987 |
| 26S Konita | 02 May - 07 May | 13 | 90(46) | 954 |
| 27P Adel | 13 May - 16 May | 7 | 45(23) | 991 |
| | JTWC Total | 263 | | |
| | | 35* | | |
| | Grand Total | 298 | | |

* Warnings issued by NAVPACMETOCCEN

NOTE: Names of Southern Hemisphere tropical cyclones are assigned by the appropriate sub-regional Tropical Cyclone Advisory Center (Madagascar and Mauritius) or Tropical Cyclone Warning Center (Australia (Perth, Darwin and Brisbane), Fiji and Papua New Guinea).

**Table 4-3** MONTHLY DISTRIBUTION OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

| YEAR | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1959-1978) | | | | | | | | | | | | | |
| AVERAGE* | - | - | - | 0.4 | 1.5 | 3.6 | 6.1 | 5.8 | 4.7 | 2.1 | 0.5 | - | 24.7 |
| 1981 | 0 | 0 | 0 | 1 | 3 | 2 | 6 | 5 | 3 | 3 | 1 | 0 | 24 |
| 1982 | 1 | 0 | 0 | 1 | 1 | 3 | 9 | 4 | 2 | 3 | 1 | 0 | 25 |
| 1983 | 1 | 0 | 0 | 1 | 1 | 3 | 5 | 6 | 3 | 5 | 0 | 0 | 25 |
| 1984 | 1 | 0 | 0 | 1 | 2 | 5 | 5 | 10 | 4 | 2 | 0 | 0 | 30 |
| 1985 | 0 | 0 | 0 | 0 | 1 | 7 | 9 | 9 | 6 | 3 | 0 | 0 | 35 |
| 1986 | 0 | 0 | 1 | 0 | 1 | 1 | 9 | 9 | 6 | 4 | 2 | 0 | 33 |
| 1987 | 0 | 1 | 0 | 0 | 1 | 3 | 6 | 8 | 3 | 4 | 1 | 1 | 28 |
| 1988 | 0 | 0 | 0 | 0 | 2 | 3 | 5 | 5 | 3 | 1 | 2 | 0 | 21 |
| 1989 | 0 | 0 | 0 | 0 | 2 | 1 | 5 | 8 | 6 | 4 | 2 | 0 | 28 |
| 1990 | 2 | 0 | 1 | 1 | 2 | 2 | 4 | 4 | 10 | 2 | 1 | 0 | 29 |
| 1991 | 0 | 0 | 1 | 1 | 1 | 3 | 2 | 5 | 5 | 2 | 1 | 1 | 22 |
| 1992 | 0 | 0 | 1 | 1 | 2 | 5 | 4 | 11 | 3 | 2 | 1 | 0 | 30 |
| 1993 | 0 | 0 | 1 | 1 | 0 | 5 | 7 | 7 | 2 | 2 | 2 | 0 | 27 |
| TOTAL | 5 | 1 | 5 | 8 | 19 | 43 | 76 | 91 | 56 | 37 | 14 | 2 | 357 |
| (1981-1993) | | | | | | | | | | | | | |
| AVERAGE | 0.4 | 0.1 | 0.4 | 0.6 | 1.6 | 3.3 | 5.8 | 7.0 | 4.3 | 2.8 | 1.1 | 0.2 | 27.5 |

* (Gray, 1979)

**Table 4-4** ANNUAL VARIATION OF SOUTHERN HEMISPHERE TROPICAL CYCLONES BY OCEAN BASIN

| YEAR | SOUTH INDIAN (WEST OF 105°E) | AUSTRALIAN (105°E - 165°E) | SOUTH PACIFIC (EAST OF 165°E) | TOTAL |
|---|---|---|---|---|
| (1959-1978) | | | | |
| AVERAGE* | 8.4 | 10.3 | 5.9 | 24.7 |
| 1981 | 13 | 8 | 3 | 24 |
| 1982 | 12 | 11 | 2 | 25 |
| 1983 | 7 | 6 | 12 | 25 |
| 1984 | 14 | 14 | 2 | 30 |
| 1985 | 14 | 15 | 6 | 35 |
| 1986 | 14 | 16 | 3 | 33 |
| 1987 | 9 | 8 | 11 | 28 |
| 1988 | 14 | 2 | 5 | 21 |
| 1989 | 12 | 9 | 7 | 28 |
| 1990 | 18 | 8 | 3 | 29 |
| 1991 | 11 | 10 | 1 | 22 |
| 1992 | 11 | 6 | 13 | 30 |
| 1993 | 10 | 16 | 1 | 27 |
| TOTAL | 159 | 129 | 69 | 357 |
| (1981-1993) | | | | |
| AVERAGE | 12.2 | 9.9 | 5.3 | 27.5 |

* (Gray, 1979)

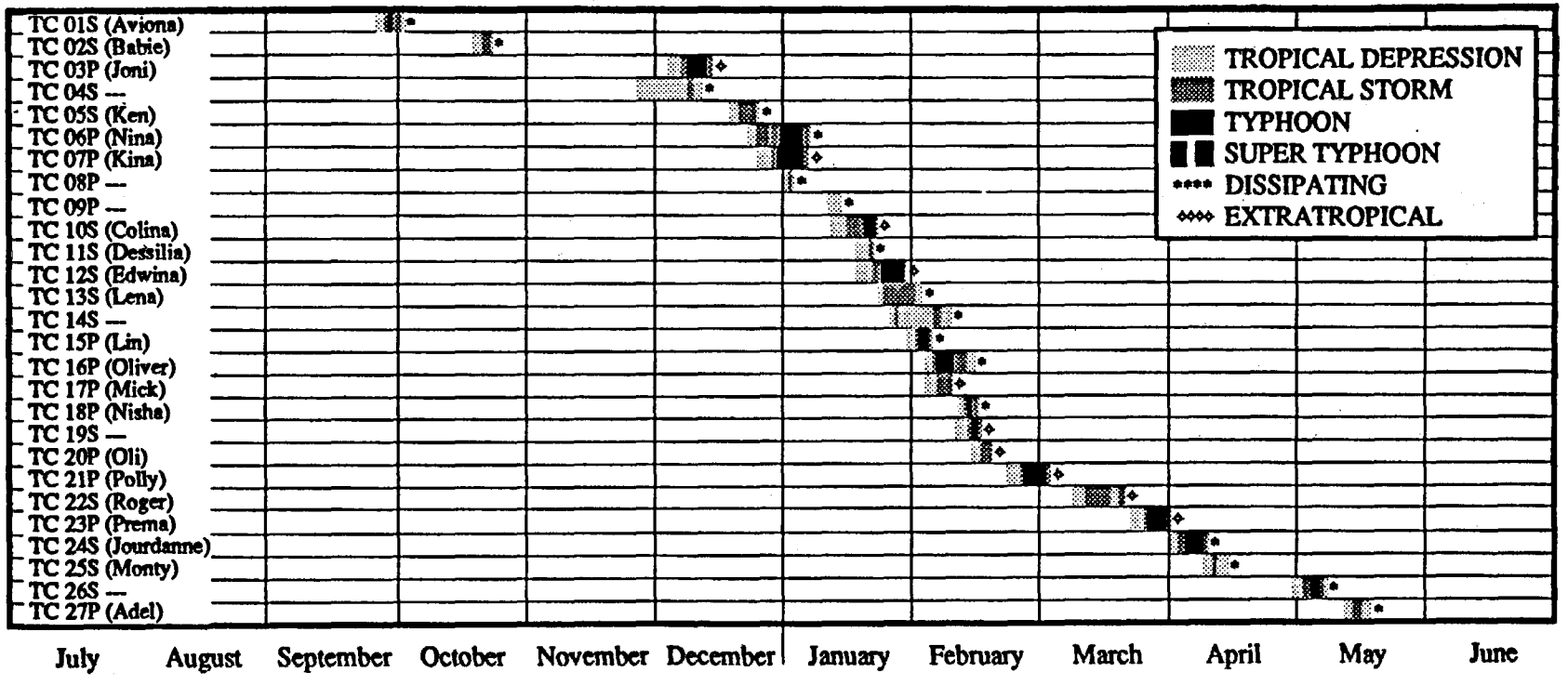


**Figure 4-1** Chronology of South Pacific and South Indian Ocean tropical cyclones for 1993 (1 July 1992 - 30 June 1993)

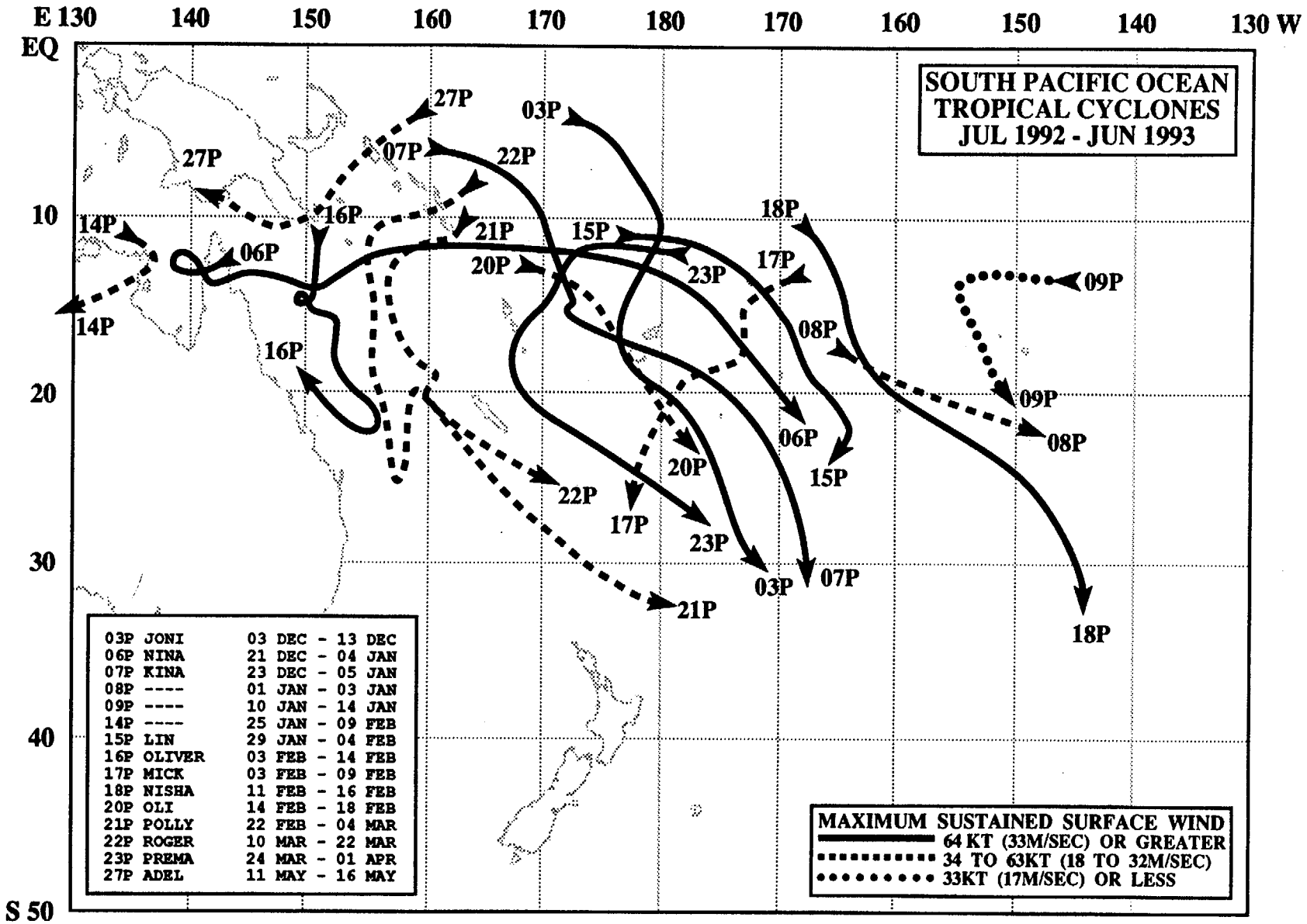


Figure 4-2 Tropical cyclone best tracks east of 130° east longitude

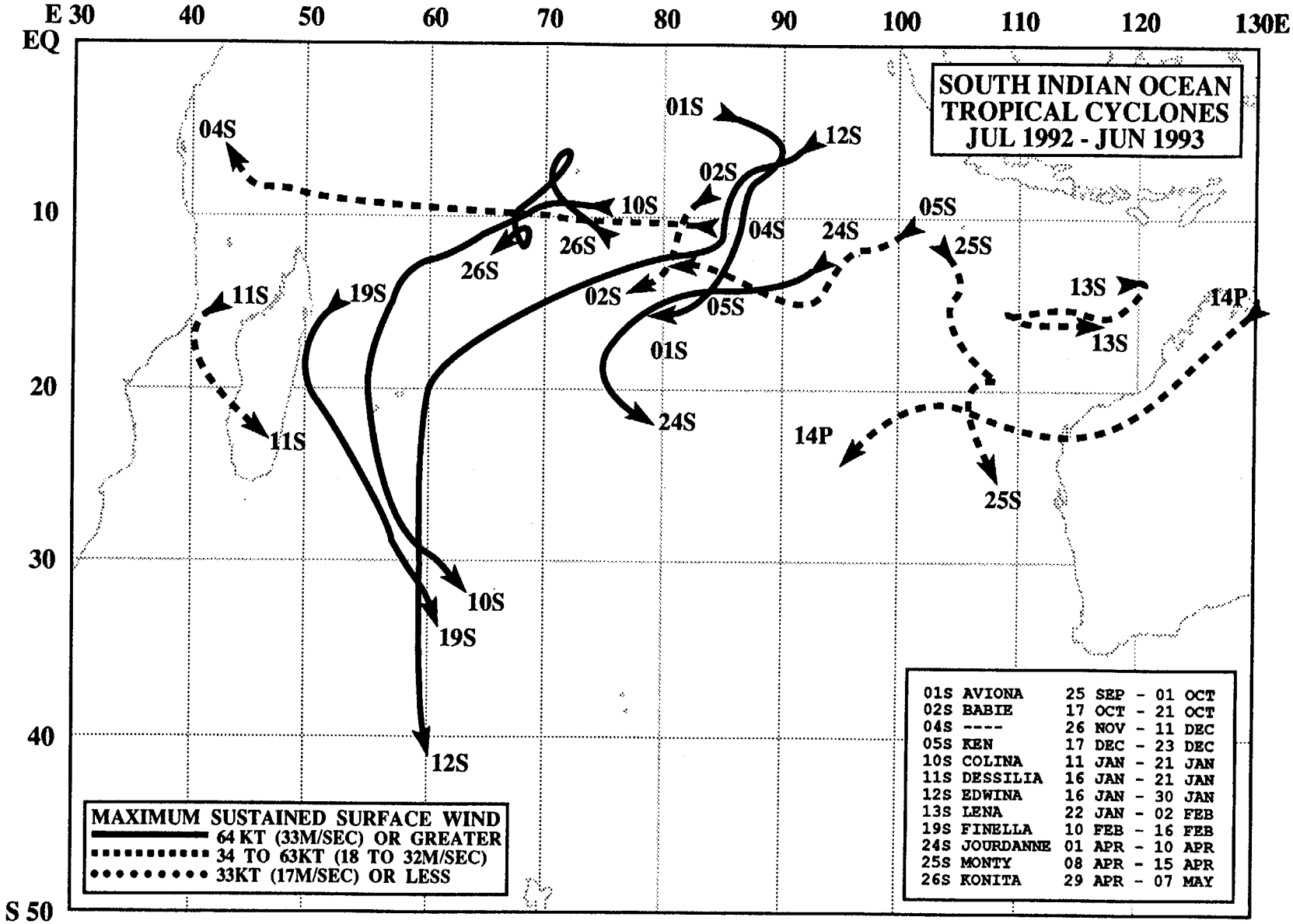


Figure 4-3 Tropical cyclone best tracks west of 130° east longitude